REMARKS

Claim 17, which was objected to, is amended to overcome the objection.

Claims 1-11 were rejected under 35 USC 101 because, according to the Examiner, the claimed invention is directed to non-statutory subject matter.

Independent claims 1 and 12 are amended herein to overcome the rejection. The amendment claims specify that the method, which operates on (encodes) an audio signal, is executed in an apparatus. As amended, it is respectfully submitted that claims 1 and 12 are statutory, and so are claims 2-11 and 13-20, which depend on claims 1 and 12, respectively.

Claim 1-6 and 10-17 were rejected under 35 USC 103 as being unpatentable over J. Herre et al (hereinafter referred to as Herre), "Enhancing the Performance of Perceptual Audio Coders by Using Temporal Noise Shaping (TNS)" in view of K. Brandenburg et al (hereinafter referred to as Brandenburg), "'NMR' and 'Masking Flag': Evaluation of Quality Using Perceptual Criteria."

Applicants respectfully traverse.

In connection with claim 1, the Examiner asserts that Herre discloses the step of "determining a representation of the envelope of the part of said x(t) that is inside a particular cochlear filter band" (the first step of claim 1), and in support of this assertion the Examiner points to Equation 1 on page 6 of Herre. The first part of the Examiner's statement (that equation 1 is a representation of the envelop") is correct, but the second part is not correct. Equation 1 pertains to the entire band of the signal, and not for <u>the part of said x(t) that is inside a particular cochlear filter band</u>, as claim 1 specifies.

The Examiner also asserts that Herre discloses the step of "quantifying a roughness measure for said envelope." In support of this assertion the Examiner points to equation 2 on page 6 of the reference, and states that it

> discloses a formula relating the power spectral density of a signal to its autocorrelation function, which describes the roughness measure for said envelop in light of the specification (see Johnston, pg 5, lines 25-27)

Applicants respectfully disagree. Again, the first part of the Examiner's statement (that equation 2 is a formula relating the power spectral density of a signal to its autocorrelation function) is correct, but the second part of the Examiner's statement is not

correct. The Examiner cites lines 25-27 on page 5 of the application, where the text states:

> In accordance with such teachings, the rougher the frequency-domain spectrum $S_{xx}(f)$, the more predictable is the corresponding time signals $x(t)$; i.e., the higher the prediction gain.

It is true that applicants' variable $S_{xx}(f)$ corresponds to equation 2 of Herre, and probably that is why the Examiner cited the paragraph. However, applicants respectfully note that the above-quoted cited passage teaches that $S_{xx}(f)$ varies with frequency, and if one were to draw a plot of $S_{xx}(f)$ as a function of frequency, one can observe something that one can call "roughness" of the plot. However, <u>$S_{xx}(f)$ in and of itself is a measure of the autocorrelation (or, more precisely, autocorrelation transformed to the frequency domain)</u> and not a measure of roughness. Applicants clearly specify, at page 6 lines 4-5 of the specification that

> Therefore, for Eq. (4), prediction of $\tilde{X}_i(f)$ in the frequency domain serves as a reliable measure of roughness of the signal envelop $e_i(t)$.

Thus, what the Examiner calls "measure of roughness" is not a measure of any roughness, and it certainly is not the measure of roughness as the term is used in applicants' specification. It is respectfully submitted, therefore, that Herre does NOT describe the second step of claim 1.

In connection with the third step of claim 1, the Examiner admits that Herre does not address NMRs at all, but states that Brandenburg

> disclosed is [sic] the computation of the Noise-to-Masking ratio.

It is true that the Brandenburg reference teaches how to compute NMRs, but that computation, beginning in the right column of page 173, does not use anything akin to a roughness measure in order to compute NMRs, and certainly does not use the roughness measure that claim 1 specifies. Moreover, there is nothing to suggest that the computation of NMR that are described in Brandenburg might be done in some other way. Therefore, for *each* of the above reasons, it is respectfully submitted that amended claim 1 is not obvious in view of the Herre and Brandenburg combination of references.

Since claim 1 is not obvious in view of Herre and Brandenburg combination of references, it follows that dependent claims 2-10 are also not obvious in view of Herre and Brandenburg combination of references.

Regarding independent claim 12, the Examiner's rejection follows the rationale of the claim 1 rejection, and applicants respectfully adopt the arguments made in connection with claim 1. Therefore, it is respectfully submitted that claim 12 is not obvious in view of the Herre and Brandenburg combination of references, and the same applies to the claims that depend on claim 12.

In addition, applicants believe that the limitations of the dependent claims confer additional patentability on the claims.

Regarding claims 2 and 13, it is true that the reference teaches that one can define a variable that is the square of the Hilbert envelope, but that, *per se*, does not teach that one should determine the representation of the envelope by the square of the envelope – in contrast to determining the representation of the envelop by the envelop itself (as the Examiner did in connection with the rejection of claim 1), or some other form for representing the envelop. There is no suggestion in Herre that the <u>square of the Hilbert envelope ought to be used</u> as the quantity whose roughness is quantified. Therefore, it is respectfully submitted that claim 2 is not obvious in view of the Herre and Brandenburg combination of references.

Regarding claim 3 and 14, the same argument holds; that is, Herre teaches the single sided frequency spectrum defined in claims 3 and 14, but does not teach or suggest that this ought to be the representation of the envelope (whose roughness is later quantified). Therefore, it is believed that claims 3 and 14 are not obvious in view of the Herre and Brandenburg combination of references.

Regarding claims 4 and 15, the Examiner points to the 4th bullet on page 13, which teaches that the TNS processing taught by Herre

> can be applied either for the entire spectrum, or to any part of the spectrum, the time-domain noise control can be applied in any necessary frequency-dependent fashion. In particular, it is possible to use several filters operating on distinct frequency (coefficient) regions.

Respectfully, that does not address <u>cochlear</u> filters, which is the restriction imposed in claims 4 and 15. Therefore, it is believed that claims 4 and 15 are not obvious in view of the Herre and Brandenburg combination of references.

Regarding claims 5 and 16, the arguments pertaining to claims 2, 13, 3, and 14 apply to claims 5 and 16.

Regarding claims 6 and 17, the Examiner cites the second paragraph on page 7 of the Herre reference and states "Linear predictive coding (LPC) is applied to signal in the frequency domain, which is the domain where the roughness of the envelope is measured." Applicants respectfully traverse. First, the cited second paragraph simply states that

> the optimum coding techniques may be derived, however, by swapping time and frequency domain which leads to either direct coding of the time domain data or predictive coding of spectral data.

While this teaches that linear predictive coding of spectral data may be used, it is certainly not a teaching that linear prediction of the time function $e_i(t)$ is or ought to be used to create a roughness measure. Therefore, it is believed that claims 6 and 17 are not obvious in view of the Herre and Brandenburg combination of references.

Regarding claim 10, the Examiner asserts that "raising the roughness measure to another power" is obvious because of the known notion of taking the log of the density measure. Respectfully, aside from the tenuousness of the base argument, this argument cannot possibly be valid, because it can be asserted with equal vehemence to raising the roughness measure to ANY power; including, for example, to power 17. There has to be some reason to recognize that the power 8 is obvious in light of some teachings, before a valid rejection can be asserted.

Separately, it is noted that taking the log of the noise density is NOT a roughness measure (at best it is a function of, for example, time). Moreover, it is noted that claim 10 defines the NMR for a given cochlear band as a ratio of roughness measures that is taken to the 8^{th} power (or, as the Examiner put it, the "squared normalized roughness value to the 4^{th} power"), but there is no actual description or suggestion in any of the cited references, or their combination, for ANY of the terms' involvement in determining the NMR for a given cochlear band – that is, "normalized roughness value," "squared", and "raised to the 4^{th} power."

Therefore, it is respectfully submitted that claim 10 is not obvious in view of the Herre and Brandenburg combination of references.

Regarding claim 11 (which depends on claim 10) applicants respectfully add the arguments relative to claim 6 to the arguments relative to claim 10, and submit that claim 11 is not obvious in view of the Herre and Brandenburg combination of references.

Claims 7-9 and 18-22 were rejected under 35 USC 103 as being unpatentable over Herre in view of Brandenburg and further in view of Smyth, US Patent 5,956,674. Applicants respectfully traverse.

First, even if the Smyth reference taught normalizing roughness measure by the roughness measure of a pure tone, the patentability of claims 7-9 and 18-22 still holds, by virtue of their dependence on independent claims 1 and 12, respectively. Second, according to the Examiner, the Smyth reference teaches mapping prediction gains for a sine wave. This assertion refers to the following sentence in Smyth:

> The prediction gain within each subband can be mapped to a set of tonality ratios such that a sine wave and white noise in any subband produce prediction gains that have tonality ratios of 1.0 and 0.0 respectively.

The above-quoted sentence refers to a sine wave and white noise; and the "prediction gain" to which it refers is the "prediction gain of the ADPCM coder" (col. 3, line 34). Thus, it does not teach normalizing roughness measure and, therefore, it is respectfully submitted that claims 7 and 18 are not obvious in view of Herre, Brandenburg and Smyth combination of references, and the same conclusion applies to claims 8-9 and 19-22, which depend on claims 7 and 18, respectively,

In light of the above amendments and remarks, applicants respectfully submit that all of the Examiner's objections and rejections have been overcome. Reconsideration and allowance are respectfully solicited.

Respectfully,
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Dated: ______________

By_______________________________

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